National Institute of Environmental Health Sciences

Dry weather induces outbreaks of human West Nile virus infections

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Abstract:

BACKGROUND: Since its first occurrence in the New York City area during 1999, West Nile virus (WNV) has spread rapidly across North America and has become a major public health concern in North America. By 2002, WNV was reported in 40 states and the District of Columbia with 4,156 human and 14,539 equine cases of infection. Mississippi had the highest human incidence rate of WNV during the 2002 epidemic in the United States. Epidemics of WNV can impose enormous impacts on local economies. Therefore, it is advantageous to predict human WNV risks for cost-effective controls of the disease and optimal allocations of limited resources. Understanding relationships between precipitation and WNV transmission is crucial for predicting the risk of the human WNV disease outbreaks under predicted global climate change scenarios. METHODS: We analyzed data on the human WNV incidences in the 82 counties of Mississippi in 2002, using standard morbidity ratio (SMR) and Bayesian hierarchical models, to determine relationships between precipitation and human WNV risks. We also entertained spatial autocorrelations of human WNV risks with conditional autocorrelative (CAR) models, implemented in WinBUGS 1.4.3. RESULTS: We observed an inverse relationship between county-level human WNV incidence risk and total annual rainfall during the previous year. Parameters representing spatial heterogeneity in the risk of human exposure to WNV improved model fit. Annual precipitation of the previous year was a predictor of spatial variation of WNV risk. CONCLUSIONS: Our results have broad implications for risk assessment of WNV and forecasting WNV outbreaks. Assessing risk of vector-born infectious diseases will require understanding of complex ecological relationships. Based on the climatologically characteristic drought occurrence in the past and on climate model predictions for climate change and potentially greater drought occurrence in the future, we suggest that the frequency and relative risk of WNV outbreaks could increase.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2841181

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Precipitation

Extreme Weather Event: Drought

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location: ☑

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Vectorborne Disease

Vectorborne Disease: Mosquito-borne Disease

Mosquito-borne Disease: West Nile Virus

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content